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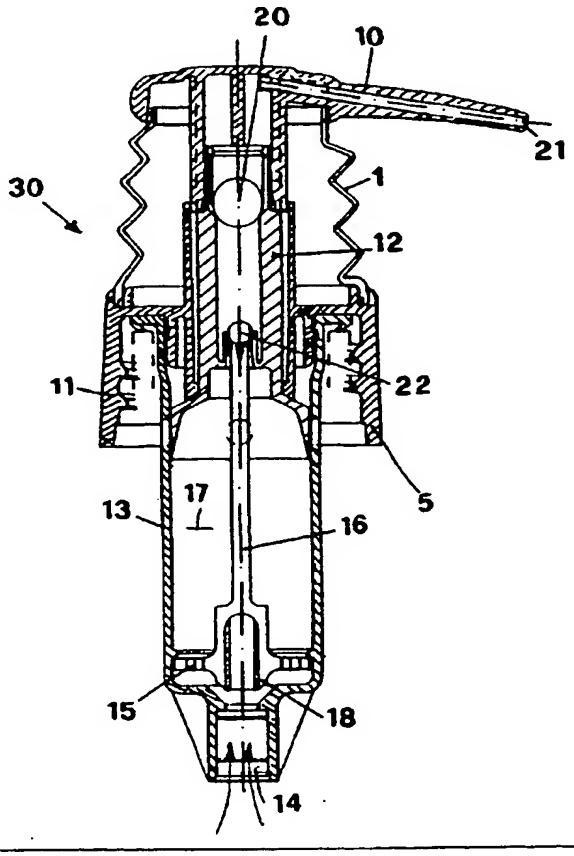
(57) Abstract

Dosing pump for liquids to be connected to a container, comprising: a cylindrical chamber (13; 130) receiving the liquid to be dispensed, a first piston (12; 120) sliding inside said cylindrical chamber, a second piston (16; 160), also placed inside said cylindrical chamber, coaxial with respect to the first piston and acting as a valve element, check valves (20, 18, 22, 220, 180), at least an elastic element (1, 6; 600) that makes the piston go back to its rest position after the dispensing, characterized in that said elastic means (1, 6; 600) is a bellows made of plastic, carried out by injection molding and having a spiral-shaped side surface.



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PLASTIC DOSING PUMP FOR DISPENSING LIQUIDS FROM CONTAINERS

The invention is a plastic dosing pump for dispensing liquids from containers, generally made of plastic, too.

As everybody knows, pumps for dispensing liquids from containers are widespread. They are mainly used, for example, to dispense liquid soaps, creams and other types of detergents or cosmetics.

The pumps used at the moment in most dispensers have parts made of plastic material and others made of steel, such as the return springs.

The presence of two different materials involves problems in recycling the material.

As a matter of fact, if the pump were completely made of plastic material, the plastic would be salvaged to be ground without any difficulties, while on the contrary the presence of ferrous material makes grinding impossible, since in this case it is first necessary to sort out plastic from iron in order to subsequently grind plastic.

Because of these difficulties, the pumps for dispensing liquids described above do not undergo the recycling of the material and consequently involve problems as to the disposal of wastes.

A known kind of pumps, even if without metallic parts, is composed of parts made of plastic materials which are not, however, compatible with one another, so that the material obtained after grinding can be recycled, but it cannot be used again since it is made of incompatible plastic materials.

Some pumps are also known that, instead of a spring, use a plastic bellows as elastic element, which is obtained by means of blow molding.

Said bellows consists of several elements which are substantially toroidal and placed one on the other, so that, as the cross-section shows, the bellows profile has a sequence of expansions and constrictions on horizontal

planes.
With this type of profile it is necessary to carry out the molding by means of the blow molding process because it is obviously difficult to make an injection mold, since it would require a tap which actually could not be taken out.
The aim of the invention is to get over the difficulties explained above.
One of the goals of the invention is to carry out a pump for dispensing liquids made of one or more plastic materials compatible with one another that can be recycled and used again.
Another aim is to get a pump substantially cheaper than that already known as far as both the materials and the assembly cycle are concerned.
All the above mentioned goals and others that will be better highlighted below have been achieved by a dosing pump for liquids to be connected to a container, comprising:
- a cylindrical chamber receiving the liquid to be dispensed;
- a first, partly hollow piston working inside said cylindrical chamber;
- a second piston also placed inside said cylindrical chamber, coaxial with respect to said first piston and acting as a valve element;
- check valves;
- at least an elastic element that makes the piston go back to its rest position after sending out the liquid,
characterized in that said elastic element is a bellows made of plastic, carried out by injection molding and having a spiral-shaped side surface.
To advantage, according to the invention, the spiral shape of the outer surface of said bellows makes it possible to carry out the bellows by the injection molding of thermoplastic material, making use of a tap that can be fastened

on or unfastened from the die respectively by screwing or unscrewing it.

The possibility of using the injection molding process, instead of the blow molding process, allows one to economize on molding time and as a consequence, in conclusion, to achieve a cheaper bellows compared to the different-shaped bellows obtained with the blow molding process.

The saving which can be achieved on the cost of the dosing pump, even if it only concerns the bellows of said pump, is in any case convincing, if we consider the quantity of pieces that are produced and demanded by the market.

Furthermore, the possibility of making such pumps compatible with the needs connected with the recycling of the material solves one of the most important problems we have to face nowadays.

Besides, to advantage, the materials making up the pump are all plastic materials, which, even if different, belong to the same family of organic plastic materials and can consequently be used again.

Other advantages and distinctive features of the invention in question will be better highlighted in the description of two applications, chosen among many, of the invention illustrated in the attached tables:

- figure 1 shows the pump object of the present invention in perspective;
- figure 2 shows a cross section of the pump object of the present invention;
- figure 3 shows a cross section of a bellows with a conic-shaped spiral;
- figure 4 shows a side view of the bellows of figure 3;
- figure 5 shows an executive variant of the bellows of the invention here carried out according to the profile of a cylindrical spiral;
- figure 6 shows a side view of the bellows of figure 5;
- figure 7 shows an executive variant of the pump object of

the present invention represented in its rest position.;
- figure 8 shows the executive variant of the pump represented in figure 7 while dispensing the product.

With reference to the above mentioned figures it can be noticed in figure 4 that the bellows, referred to as a whole by 1, shows a truncated-cone-shaped surface 2 and this is also evident in the cross section of figure 3.

Such a special shape allows the mold tap to respectively screw on and unscrew off the die during the injection molding and consequently makes it possible to take out both the tap and the manufactured product.

Figure 3 also shows that, in the receding parts of the cross section, the profile is thicker, as it is shown in 3, obviously to strengthen the bellows on the bending points which are subject to greater stress, without stiffening said bellows.

Bellows 1 is open on the upper rim 4 and on the lower rim 5; more precisely rim 4 is placed on the lower part of the dispenser element 10 of figure 2, while the lower part 5 fits on the cylindrical element 11 that screws on the container, which is not shown in figure 2.

Figures 5 and 6 show a variant of the bellows referred to as a whole by 6; the difference lies in the fact that the side surface of said bellows is cylindrical-spiral-shaped instead of conic-spiral-shaped.

Obviously, the possibility of molding thermoplastic material by injection has been left unchanged, since the tap can get into the inside of the die by screwing and then move by unscrewing after the cast and this is due to the fact that the outer and inner surface of the bellows is spiral-shaped.

Also in the case of the variant of figures 5 and 6 the thickening of the material 7 is envisaged in the receding parts of the bellows, so that said bellows is strengthened on the weakest parts which are subject to greater stress

during the compression.
Figure 2 shows that the bellows of the invention, the same that can be seen in figures 3 and 4, has been set up on a pump that works in a known way. Actually the dispenser element 10 is connected to a first piston 12 sliding inside a cylindrical chamber 13; the liquid to be dispensed flows inside said chamber first through hole 14 and then through the distribution holes 15, which are at the bottom 18 of the second piston 16; said piston is inside the cylindrical chamber 13 and works as a valve element along with the upper ball 22.
The following outlines basically describe the operation of the dosing pump object of the invention, which is however well known.
In such a pump, referred to as a whole by 30, when the dispenser element 10 is pushed down, it pulls also the first piston 12 which reaches the end of stroke and makes the second piston 16 position itself so that the opening 14 is closed by its bottom 18.
When the dispenser element is loosened, because of the spring back of bellows 1 also the first piston 12 moves back upwards. This way it causes also a depression inside the container of the liquid and consequently the liquid is drained out of the container and fills the interior 17 of the cylindrical chamber 13. The liquid flows through hole 14 and through the other holes 15.
Pushing down the dispenser element 10 again, both the first 12 and the second piston 16 lower, so that hole 14 is closed from the bottom 18 of said second piston 16. This way, since the pressure of piston 12 goes on inside the chamber 13, the liquid contained in it flows through the space created by the backlash existing between the inner diameter of the first piston 12 concerning the rod of the second piston 16 and the outer diameter of the rod of said second piston 16. The liquid, lifting the ball 20, reaches

the opening 21.
When the pressure on the dispenser element 10 stops, the reversal of the first piston 12 causes the reversal upwards of the second piston 16 and its consequent disjunction from the bottom, while the ball 20 gets to the closing position, so that another quantity of liquid reaches the inner space 17 of the chamber 13 through hole 14 and holes 15, so the chamber is full of liquid ready to be dispensed again.
Figures 7 and 8 show an executive variant of the pump of the invention, where it can be seen that in such a pump too, referred to as a whole by 300, the dispenser element 100, when it is pushed down, pulls also a first piston 120 connected to it and provided with an inner hollow 221.
The latter, in turn, pulls downwards also the second piston 160 by means of the projections 121; said second piston 160, as it can be observed, is placed on the outside of the first piston 120 and in the inside of the cylindrical chamber 130, so as to cause the closing of the passage 140 by means of the valve element consisting of the ball 180.
When the dispenser element is loosened, because of the spring back of bellows 600 the first piston 120 and the second piston 160 move back upwards, so that the inner volume 170 of the cylindrical chamber 130 is filled by the liquid coming from the underlying container and flowing through the passage 140 left free by the valve element 180 which is raised.
Pushing down the dispenser 100 again, the liquid contained in the volume 170 of the chamber 130 goes into the first piston 120 by direction 131 and flows outwards through the dispenser element 100, after going through hole 122 made at the end 220 of the first piston, where said end acts as a valve element.
The above description of the invention has consequently highlighted that all the aims of the invention have been achieved, since they lie in the fact that it is possible to

carry out a pump for dispensing liquids made of plastic material only.

The elements composing the pump object of the invention are preferably made of polypropylene and polythene, which can be both recycled and used again after being ground because they are perfectly compatible, since they belong to the polyolefin family.

Moreover, the bellows, which acts as an elastic element of the pump, has been carried out by injection molding.

Any executive variant is to be considered as completely protected by the invention in question.

CLAIMS

1) Dosing pump for liquids to be connected to a container, comprising:
- a cylindrical chamber (13; 130) receiving the liquid to be dispensed;
- a first piston (12; 120) sliding inside said cylindrical chamber;
- a second piston (16; 160), also placed inside said cylindrical chamber, coaxial with respect to the first piston and acting as a valve element;
- check valves (20, 18, 22, 220, 180);
- at least an elastic element (1, 6; 600) that makes the piston go back to its rest position after the dispensing, characterized in that said elastic means (1, 6; 600) is a bellows made of plastic, carried out by injection molding and having a spiral-shaped side surface.

2) Dosing pump according to claim 1), characterized in that said check valves consist of an upper ball (22) and a bottom (18), each being placed at one end of said second piston (16) sliding inside said cylindrical chamber (13), and a ball (20) operating with said first piston.

3) Dosing pump according to claim 1), characterized in that said check valves include the end (220) of said first piston (120), provided with a hole (122) to connect the hollow (221) of said first piston (120) to the inner volume (170) of said cylindrical chamber (130) and with a ball (180) placed at the bottom of said cylindrical chamber (130) to intercept the communicating passage (140) of said pump with the underlying container.

4) Dosing pump according to claim 1), characterized in that said second piston (16) is placed inside said cylindrical chamber (13) and is internally coaxial with said first piston (12).

5) Dosing pump according to claim 1), characterized in that said second piston (160) is placed inside said cylin-

drical chamber (130) coaxial on the outside with said first piston (120) and is between the outer surface of said first piston (120) and the inner surface of said cylindrical chamber (130).

6) Dosing pump according to claim 1), characterized in that said bottom (18) of said second piston (16) works for the sealing with at least one hole (14) made at the bottom of said cylindrical chamber (13) and it is provided with through holes (15) to connect said cylindrical chamber (13) to said at least one hole (14) made on its bottom.

7) Dosing pump according to claim 1), characterized in that the side surfaces of the bellows are cylindrical-spiral-shaped.

8) Dosing pump according to claim 1), characterized in that the side surface of the bellows is conic-spiral-shaped.

9) Dosing pump according to claims 1), characterized in that the bellows shows a profile (3, 7) in its receding parts thicker than the average thickness of said bellows.

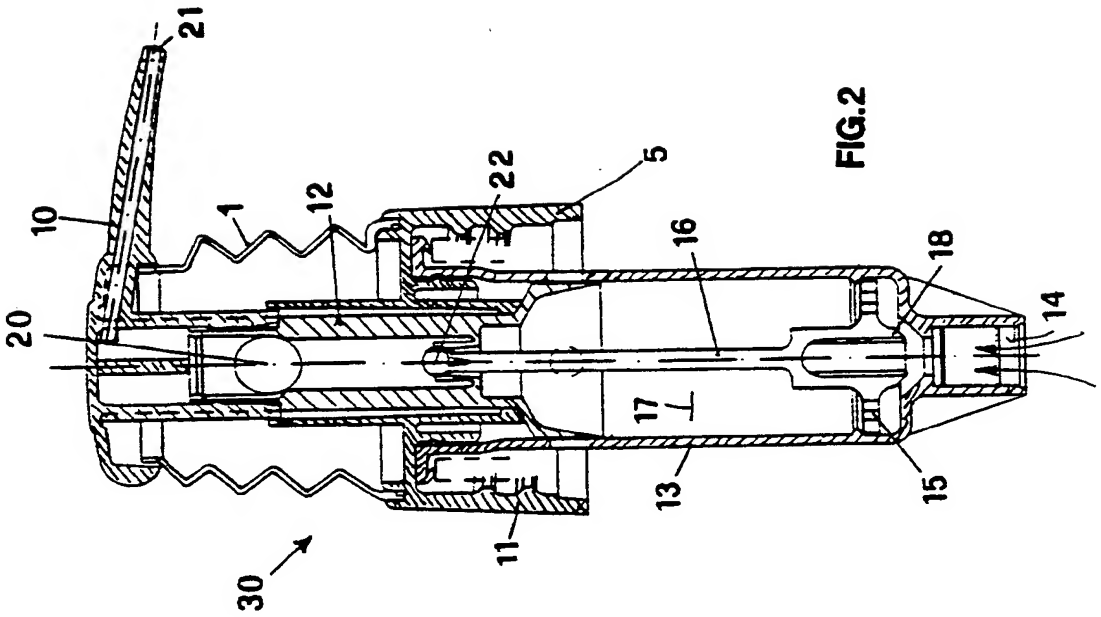

FIG.2

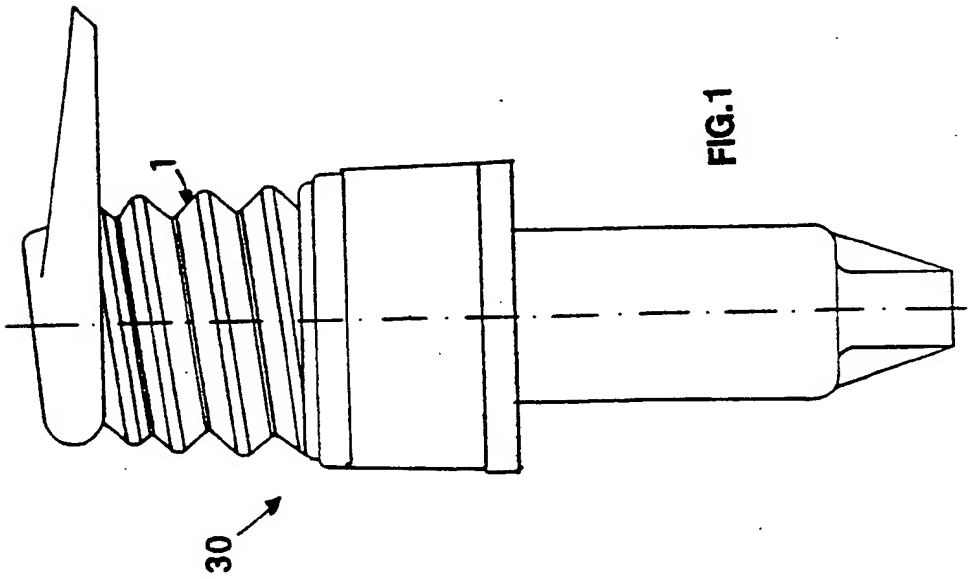

FIG.1

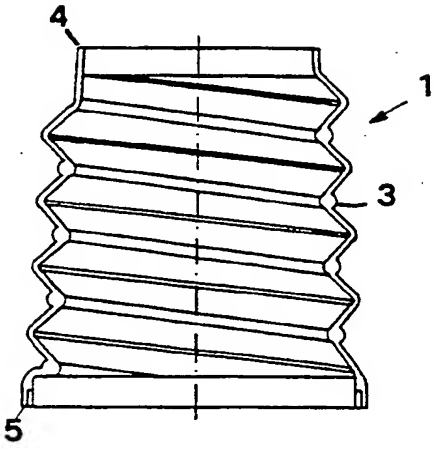

FIG.3

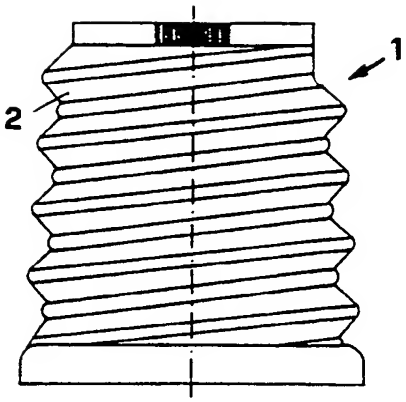

FIG.4

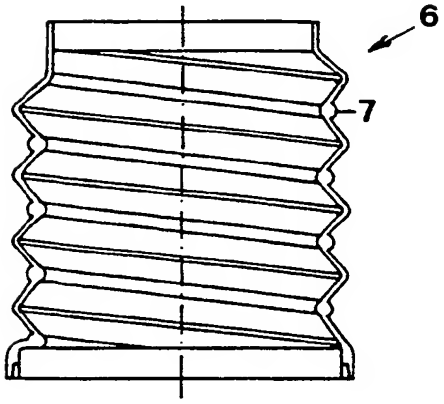

FIG.5

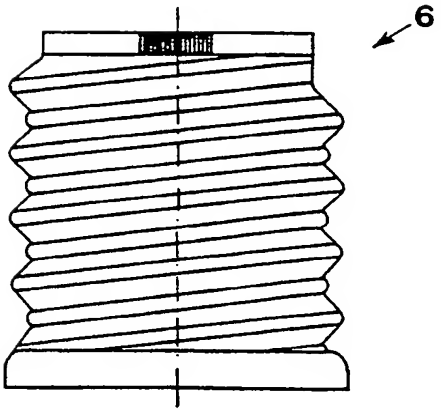

FIG.6

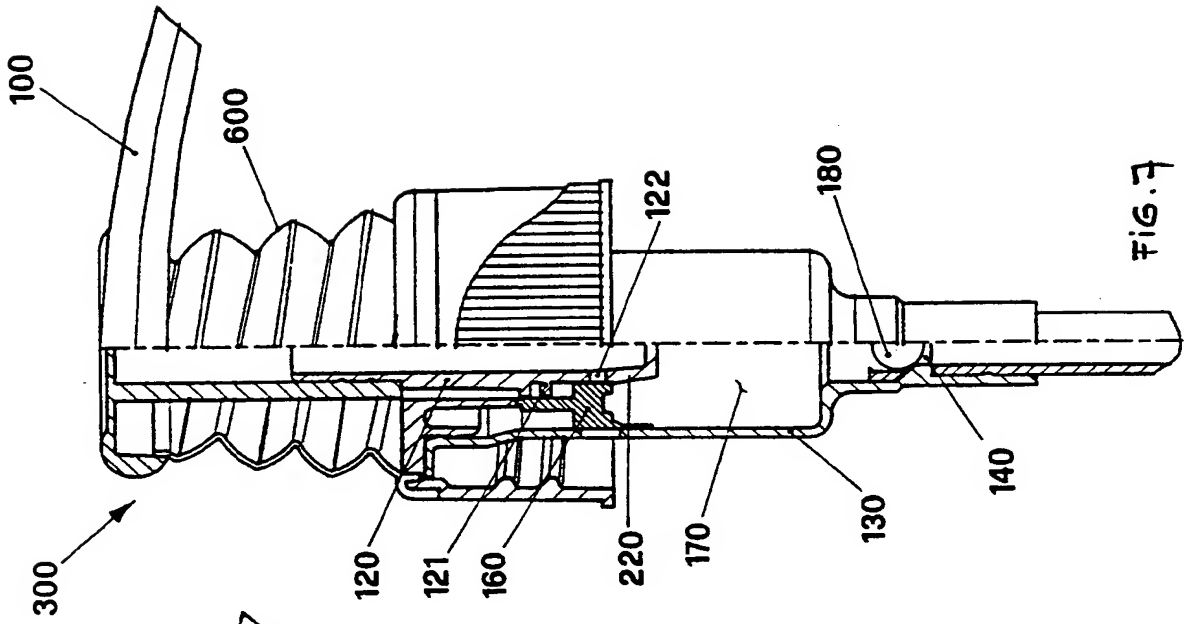
100
600
122
180
140
130
170
220
120
121
160
300

Fig.7

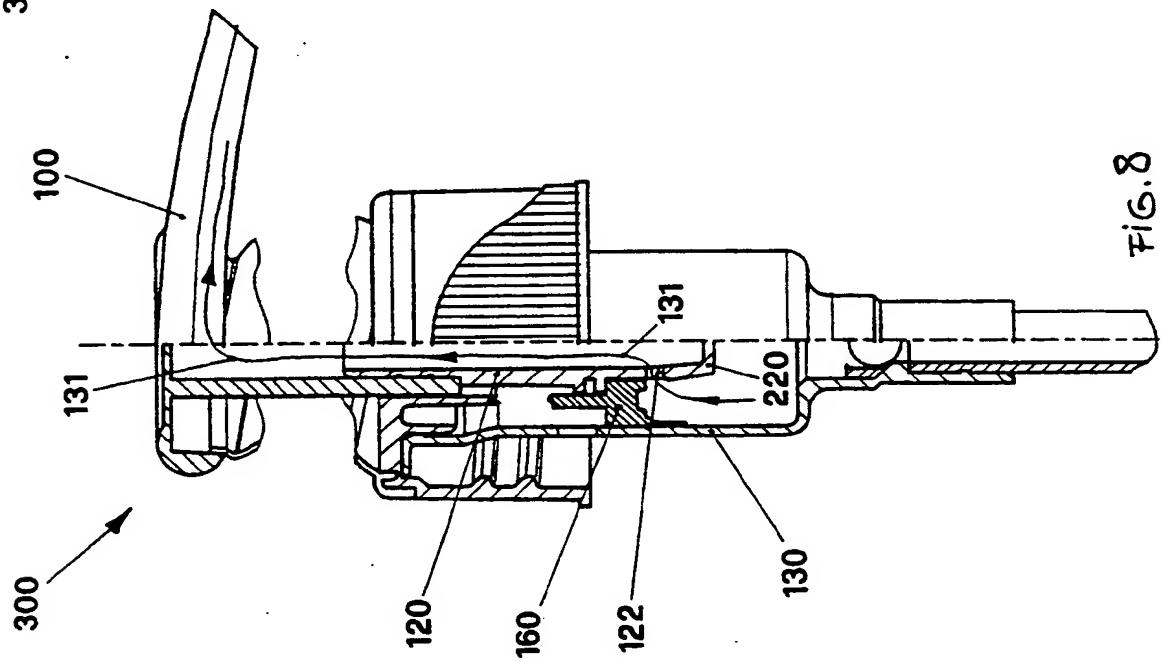
100
131
220
130
120
160
122
300

Fig.8

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 94/00674

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 B05B11/00

According to International Patent Classification (IPC) or to both national classification and IPC

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Minimum documentation searched (classification system followed by classification symbols)
IPC 5 B05B

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Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE,A,39 28 524 (MEGAPLAST) 14 March 1991 see the whole document	1
Y	WO,A,91 03321 (MEGAPLAST DOSIERSYSTEM) 21 March 1991 see page 12, line 13 - line 21; figures 1,14	1,4,7,9
Y	EP,A,0 340 724 (TUBEX VERTRIEB) 8 November 1989 see abstract; figure 7	1,4,7,9
A	FR,A,1 236 720 (THE DRACKETT COMPANY) 13 June 1960 see the whole document	2,3
A	DE,A,39 09 633 (MEGAPLAST) 11 October 1990 see column 3, line 2 - line 7; figure 2	1,8

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[X] Further documents are listed in the continuation of box C.

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A	EP,A,0 469 368 (MAS S.P.A.) 5 February 1992 see abstract; figure 1	5,6
A	EP,A,0 505 974 (PFEIFFER) 30 September 1992 see abstract; figure 1 see column 3, line 34 - line 42	1
A	BE,A,718 118 (RALET) 31 December 1968 see the whole document	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 94/00674

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